



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

INDEX.

ALGEBRA (See Solutions and Problems).

ARITHMETIC (See Solutions and Problems).

BIOGRAPHIES—

Réné Descartes, with portrait, by B. F. Finkel.....	191-195
Bolyai Janos (John Bolyai) by George Bruce Halsted.....	35-38
Tehebychev, by George Bruce Halsted.....	285-288
BOOKS, Reviewed, 32-34, 64-66, 97-98, 120-124, 159-160, 188-190, 219-220, 247-249, 283-284, 308.	

School Algebra Complete, by Fletcher Durell and Edward Robins, 32; *The Equations of Hydrodynamics*, by Joseph Collier, 33; *A New Astronomy*, by D. P. Todd, 33; *An Algebraic Arithmetic*, by S. E. Coleman, 33; *College Algebra*, by Edward A. Bowser, 64; *Elements of Calculus*, by James M. Taylor, 64; *Elements of Determinants*, by Paul H. Hanus, 64-65; *Exercises in Choice and Chance*, by William Allen Whitworth, 65; *Through Quadratic Equations*, by Jos. V. Collins, 65; *Theoretical and Practical Graphics*, by Frederick N. Willson, 120; *New Psychology*, by John P. Gordy, 122; *Mechanical Drawing*, by J. C. Tracy, 122; *Elementi di Geometria*, by G. Lazzeri e A. Bassani, 123; *Lessons in Elementary Mechanics*, by Sir Philip Magnus, 160; *Elements of Trigonometry with Tables*, by Herbert C. Whitaker, 188; *Prismoidal Formulae and Earthwork*, by Thomas U. Taylor, 188; *Lecture on the Geometry of Position*, by Theodore Reye, 188; *Elements of Plane and Spherical Trigonometry*, by J. W. Nicholson, 219; *Introduction to Algebra*, by G. Chrystal, 219; *Infinitesimal Analysis*, by William Benjamin Smith, 220; *Advanced Mechanics*, Vol. I Dynamics, by William Briggs, 247; *Coordinate Geometry*, by Briggs and Bryan, 247; *Mensuration and Spherical Geometry*, by William Briggs, 248; *Differential and Integral Calculus*, by James M. Taylor, 248; *Differential and Integral Calculus*, by P. A. Lambert, 248; *Text Book of Algebra*, by George Egbert Fisher, 248; *Introduction to the Theory of Analytic Functions*, by J. Harkness and F. Morley, 249; *An Elementary Course in Analytical Geometry*, by J. H. Tanner and Joseph Allen, 249; *Lectures on Elementary Mathematics*, by Lagrange, 283; *A Manual of Experiments in Physics*, by Jos. S. Ames and William J. A. Bliss, 283; *Elements of the Differential Calculus*, by James McMahon, 283; a Treatise on Roofs and Bridges, with numerous exercises, by Edward A. Bowser, 308.

DIOPHANTINE ANALYSIS (See Solutions and Problems).

EDITORIALS, 30-32, 64, 159-160, 187-188, 219, 282-283, 305-308.

ERRATA, 34, 66, 98, 126, 220, 250.

GEOMETRY (See Solutions and Problems).

MATHEMATICAL PAPERS—

Burnham, A. C., On some Cases when the Quintic is Solvable by Elementary Methods.....	99-101
Calderhead, James A., New and Old Proofs of the Pythagorean Theorem....	73-74
Dickson, L. E., A New Solution of the Cubic Equation.....	38-39
Halsted, George Bruce, Non-Euclidean Geometry: Historical and Expository.....	1-2, 67-68, 127-128, 290-291
The First Award of the Lobachevski Prize.....	39-41
Translation of Monsanto's Theorema.....	265-266
Heaton, Henry, Infinity, the Infinitesimal, and Zero.....	224-226
Landis, W. W., A Method of Defining the Ellipse, Hyperbola, and Parabola as Conic Sections.....	72-73
Lovett, Edgar Odell, Sophus Lie's Transformation Groups.....	2-9, 75-82
Miller, Dr. G. A., Note on the Application of a Substitution Group in Spherical Trigonometry.....	102-103

On Several Points in the Theory of Groups of a Finite Order..... 196-199
 On the Groups which are Determined by a Given Group..... 221-224
 Monsanto, J. M., Teorema, Translation by Dr. Halsted 265-268
 Moulton, F. R., On the Best Method of Solving the Markings of Judges of
 Contests 68-72
 Nicholson, J. W., Reply to Professor Fisk's Criticism of a Certain Feature
 of Nicholson's Calculus 199-201
 Roe, E. D., Jr., Note on a Formula of Symmetric Functions..... 161-164
 Rothrock, David A., Point Invariants for the Finite Continuous Groups of
 the Plane..... 249-264
 Yanney, B. F., New and Old Proofs of the Pythagorean Theorem 73-74
 Zerr, G. B. M., Summation of Series..... 128-135
 Convex Surface and Volume of Conical Ungulae..... 164-170

MISCELLANEOUS (See Solutions and Problem).

NOTES, 62-64, 125-126.

Note on the synchronous setting or rising of the cusps of a crescent moon, by S. Hart Wright, 27; The first award of the Lobachevski Prize, by George Bruce Halsted, 39-41; Note on second solution of problem 49, Mechanics, by Alfred Hume 51; A note from McLellan and Dewey's Psychology of Number and from Lefevre's Number and Its Algebra, 57; A note on Euler's attempts of finding triangles of commensurable sides and medians, 59; Notes on the Evanston meeting of the American Mathematical Society, by G. A. Miller, 62-64; Note on the practical application of a substitution group in spherical trigonometry, by G. A. Miller, 102-103; Note on an extract from Dr. Laisant's book, *La Mathematique*, by Dr. Alexander Macfarlane, 125-126; Note on Mr. J. F. Travis's solution of problem 87, Arithmetic, 139; Note on J. M. Boorman's solution of problem 78, Algebra, by Josiah H. Drummond, 174; Note on solution of problem 69, Calculus, by Josiah H. Drummond, 177; Note on Professor Zerr's solution of problem 60, Diophantine Analysis, by Josiah H. Drummond, 182; Note by the editor, B. F. Finkel, as answer to a query, 202; Note on a demonstration of problem 98, Geometry, by B. F. Finkel, 234; Reply to note of Dr. Drummond on problem 78, Algebra, by J. M. Boorman, 270.

PORTRAITS, Leonhard Euler, facing page 1; René Descartes, facing page 191.

PERIODICALS, 34, 66, 97-98, 124-125, 160, 190, 220, 308.

SOLUTIONS AND PROBLEMS.

ARITHMETIC.

A and B traveling at uniform and stated rate, B turning twice, to find B's rate. No. 87 170-171
 A barn 20 feet square, standing in a pasture, horse tied by a rope of 50 feet tied to a corner, find area of land grazed over. No. 93..... 11
 A chaise turning within a ring, to find the circumference. No. 85 267-268
 A man gained 3% on his money in July, lost 2% in August, what per cent. of his money July 1, is his money September 1. No. 101..... 138
 An interest-bearing note of \$1000 with several indorsements, find amount due at a stated time. No. 91 136-138
 A owes \$6000, bearing 6% interest, debt to be paid in 6 equal payments, with certain other conditions, to find amount of each payment. No. 90 291
 A's age is to B's age as 2:3, etc. No. 102 202, 227
 Debt of \$20 paid in 11 monthly installments of \$2 each, to find rate per cent. No. 98..... 136
 Find greatest number of inch balls placed in a box of given dimensions. No. 89 104
 Find principal of an interest-bearing note, payments being made at different stated times, the final amount and the date when due being given. No. 88

Find 24 triangles containing 330 square yards. No. 84.....10, 82-85
 Income realized by U. S. 4% bonds at 105, sold after 6 years at 104. No. 94 171-173
 In what time will \$4000 amount to \$1534.96, 6% interest, payable annually.
 No. 97 202
 Number of acres in a square field, whose diagonal is 10 rods longer than the
 side. No. 96 201-202
 Stock bought at 4% discount, sold at 2½% premium, brokerage in both cases,
 ¼%, net profit being \$130, find investment. No. 100 267
 300 cats kill 300 rats in 300 minutes, how many cats will kill 100 rats in 100
 minutes. No. 99 227

ALGEBRA.

A Savings and Loan Company loaned out a certain sum under some particu-
 lar terms. The question is whether the Company sustains any loss. No.88 268-270
 A starts around a circular island at a certain rate, B, C, and D start at dif-
 ferent times at given rates in opposite directions, to find size of island,
 when they meet, etc. No. 87..... 229-230
 If, on the present electoral basis, all electoral votes of each state are cast
 solid for one or the other candidates, find all possible combinations for 273
 votes for winning candidate. No. 84..... 203
 Of n persons, A gives to the others as much as each one has, so B, C, etc.
 What had each at first. No. 79 85-86

Prove identities $2 - \frac{1}{2} = \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \dots$ and $\frac{5 - \sqrt{5}}{2} = \frac{1}{2} + \frac{1}{3} + \frac{1}{3 \cdot 7} + \dots$ No. 76 14-17

Show $\frac{a_1^r}{(a_1 - a_2)(a_1 - a_3) \dots (a_1 - a_n)} + \frac{a_2^r}{(a_2 - a_1)(a_2 - a_3) \dots (a_2 - a_n)} + \dots$ is 0, if $r < n - 1$, = 1, if $r = n - 1$, and to $\sum a_n$, if $r = n$. No. 81 105-106, 129-141

Solution of two simultaneous equations by quadratics. No. 89 301

Solve equation $(6x^2 + x - 3)^2 - 48^2 = (x + 15)^2$. No. 77..... 17

Sum $\frac{1}{1^2 \cdot 2^2 \cdot 3^2 \cdot 4^2 \cdot 5^2} + \frac{2}{2^2 \cdot 3^2 \cdot 4^2 \cdot 5^2 \cdot 6^2} + \dots$ No. 85..... 203-205

$x^2 + yz = 16, y^2 + xz = 17, z^2 + xy = 22$. No. 86..... 227-229

$x^2 + xy = 10, y^2 + xy = 15$. No. 78..... 42-45

$1 + x^4 = a(1 + x^4)$. No. 80 87

$y^2 + yz + z^2 = a^2, z^2 + zx + x^2 = b^2, x^2 + xy + y^2 = c^2$. No. 82..... 106-107

$x^2 + y = 8, y^2 + x = 60$. No. 83..... 173-174

GEOMETRY.

Area grazed over by a horse tethered to a post on the circumference of a
 circle. No. 103 296

Bisectors, if two are equal, the triangle is isosceles. No. 85..... 108-109

Bisectors of angles of opposite sides of inscribed quadrilateral cut sides at
 vertices of rhombus. No. 90 143

To bisect a line without use of circle. No. 102 295

Circle touching another internally, and a third with a radius, a mean pro-
 portional between radii, through point of contact, intersection parallel.
 No. 80..... 18

Circle tangent to three circles. No. 89 142-143

Circle to be constructed, passing through two given points and touching a
 third. No. 98..... 234

Circle, to find point in semi-circumference, sum of distances to be a maximum. No. 104	297
Collinear, center of circles being. No. 81	45-46
Escribed circles, radius of circle through centers of inscribed and two escribed circles equal to radius of circumscribed circle. No. 97	231-234
Escribed circles, centers given, and centers of inscribed circles. Prove, etc. No. 100	271-273
Extremities of base of triangle joined to extremities of angle of squares erected on two sides. No. 82	19-20
Focus, four conics having common. No. 86	109
Frustum of cone, find volume of. No. 88	109-110
Isosceles triangles described on three sides of triangle. No. 96	206-207
Locus of point, when coördinates are, as given. No. 83	46
Locus of vertices of triangle. No. 91	174-175
Locus of point, trisecting arcs having common chords. No. 84	87-89
Locus of vertices of all right cones having same ellipse as base. No. 99	270-271
Mountain, finding height of, angles of elevation and base being given No. 93	175-176
Parabola, at each point of which the rectangular hyperbola described of four pointic contact, locus of center equal parabola. No. 95	206
Perimeter, to be a minimum. No. 87	141-142
Quadrilateral, inscribed in circle. Prove $AB \cdot BC + AD \cdot CD : AB \cdot AD + BC \cdot CD = BD : AC$. No. 92	175
Tower, finding height of. No. 93	175-176

CALCULUS.

Augur hole, bored through cylinder, find volume removed. No. 63	20-23
Differential equation, given, to prove certain relations. No. 68	110
Differential equation of third order, to solve. No. 71	145-146, 176
Differential equation, given, to solve. No. 75	235-236
Differential equation, given, to solve. No. 76	236-237
Drawbridge, across which, when moving, a man walks. No. 67	89-91
Elliptic fence, to which a horse is tethered. No. 69	111
Integral, prove given, with conditions stated. No. 70	143-145
Integral, given, to solve. No. 73	207-208
Illusory value when $x=0$. No. 78	298
Park, forming parabolic segment. No. 72	177
Pedal of bicycle, find equation of a point of. No. 77	237
Rope, wound around a conical frustum, how far will a hawk fly unwinding it. No. 66	47-48
String, wound spirally around a cone, distance a duck must swim through, unwinding it. No. 65	46-47

MECHANICS.

Ball, falling through center of earth, its motion similar to that of a pendulum. No. 72	276-277
Beam is suspended by ropes from a horizontal support, angles to be found made by the ropes and support. No. 63	149-150
Body, sliding from rest down a series of smooth inclined planes, final velocity to be found. No. 54	24
Conical stick of timber, being depressed in a liquid of given density, amount of ascent to be found. No. 67	238-239
Cow, jumping over the moon. No. 56	91
Cylindrical vessel, filled with water, resting on horizontal plane, find maximum angle of elevation to which the plane must be raised. No. 64	209-213
Distance from mid-point of a chord of parabola being constant. Locus of center of gravity of segments. No. 66	238

Disturbing force of Moon for any point on earth's surface. No. 68.	239-240
Elastic string, by which a body is suspended from a fixed point. Find depression of body, so that when let go, the point of suspension is reached. No. 61.	146-148
Endless uniform chain, hanging over two small pegs, to show that in a state of equilibrium a certain given relation prevails between distances of the vertices of the two catenaries, the length of the chain and angle of inclination. No. 58.	92-93
Gold, a sphere of, whose density varies as square of distance from center, how to be divided into three parts of equal value. No. 71.	275-276
Homogenous sphere, having given angular velocity and contracting by cooling, find angular velocity when radius is reduced to one-half. No. 75	275
Intersection of two planes, over which a chord slides, find equation of path described by center of gravity. No. 57.	111-112
Isosceles triangle of vertical plane and horizontal base, supported at each end, representing 3 rods joined together. A load is suspended at one vertex, find angles between sides and base on condition, that sum of weights of rods is a minimum. No. 64	177-179
Locus of center of gravity of all segments formed by chord in parabola. No 65	179
Particle of mass moving, in circumference of ellipse in the constant rate, where it is held by attractive forces in the foci. No. 62.	148-149
Radius of a sphere of given specific gravity, which will rest in fluid varying density. No. 59	112-113
Ratio of the two legs of a uniform and heavy right triangle, being suspended from center of inscribed circle. No. 60.	113-114
Spheres, three equally heavy, are placed on a rough ground and a fourth one on top of them. No. 55	24, 48-50
Velocity, to find so that water may spill in swinging a pail with a rope. No. 74	300
Weight, supported by two props. No. 73	300

DIOPHANTINE ANALYSIS.

Arrangements, greatest number of nine digits, all taken together, whose 3 terminal figures shall be those of a square number under conditions set forth in the problems. No. 57.	93
Base of right triangle being 105, find all perpendicular and hypotenusus to fit it, such that their values shall be integers. No. 58.	51-54
Consecutive numbers, four, whose sum=square, and sum of whose squares=square. No. 61.	215-216
Cubic proper fractions, two, whose product=square proper fraction. No. 66.	215
Decomposing number, give methods of, into squares, cubes, biquadratic. No. 70.	279-301
Five numbers to be found, so that the product of any two +1=square.	301
Four square numbers in arithmetical progression. No. 62.	180-181
General value for p in $4p+1$ =sum of 2 squares. No. 68.	240-243
Infinite series of prime, integral, rational, scalene triangles where sides of every term are consecutive numbers. No. 61.	150-152
Integers, number of equal, and prime to it, show, etc. No. 56.	26
Magic squares, whose sum= $3m$. No. 55	25-26
Required to take from the proper key suitable material and construct a "nest" of 10 or 15 prime, integral, rational trapeziums. No. 74.	181-182
Six positive numbers to be found, such that if each be diminished by five-half times the fifth power of this sum, the six remainders will be rational fifth powers. No. 60.	114
Sum of m th power of all numbers less than P and prime. No. 59.	93-94

Show, that 1521 can be expressed in seven different ways as sum of three perfect squares. No. 75	214-215
Two right triangles have same base which is mean proportional between the two perpendiculars, find general solution giving integral values for all the sides. No. 69	277-279
$x^3 + y^3 = 20^3 \times 105489$, find four positive integral values. No. 63	181

AVERAGE AND PROBABILITY.

Average area cut from a circle, from a point on the surface of which 2 lines are drawn to the circumference. No. 58	114-115
Average area of a triangle, in which is a given point and a random point, the line through both divides triangle into a trapezium and a triangle. No. 64	213-214
Average velocity of a point in the circumference of a circle, rolling along a line. No. 59	115-116
Bag, containing any number of balls, which may be either black or white, one is drawn which is white, show that chance of drawing another white one is two-thirds. No. 62	213
Chance that center of gravity of a triangle lies inside a triangle formed by 3 points taken at random within the triangle. No. 56	54-55
Chance that, when a chord is drawn through 2 points in a circle, and a second chord through 2 other points, the quadrilateral formed by extremities of the two chords contains center of circle. No. 57	56-57
Four points are taken at random within an ellipse, chance that they form a re-entrant quadrilateral. No. 60	152-154

MISCELLANEOUS.

Caustic by reflexion. No. 59	156-157, 182-183, 303
Chronometers, of three, one keeps true time, two others gain and lose, find true time, when hands of other two point out certain numbers. No. 63	244-245
Conical bin of given dimensions is cut by a plane parallel to side and passing through center of base, how many bushels of wheat will it contain. No. 64	279-280
Cusps of moon's crescent: how long will they set synchronously, the latitude and declination of sun and moon being given. No. 54 and No. 56	27-28, 116
Multiply 6×4 , is the problem legitimate, when both symbols represent pure numbers. No. 55	57-58
North Latitude, the highest, in which the sun will shine in at the north window of a building at least once a year. No. 53	26-28
Particle is placed very near the center of a circle, round the circumference of which n equal repulsive forces are symmetrically arranged, each force varying inversely as the m th power of its distances from particle, show resulting force, etc. No. 57	116-118
Path of projectile, moving with constant velocity is an inverted catenary of equal strength. No. 65	302
Product, the, of n numbers, each the sum of 4 squares, may be expressed as sum of 4 squares in $(48)^{n-1}$ different ways. No. 61	184
Shadow, the longest in winter at noon, of an upright is found to be seven times as long as the shortest summer shadow of same object. No. 58	155-156
Sun's declination being given, in what latitude will it shine on north side of building during first half of forenoon, and on south side during the other half. No. 60	183-186
Triangles, whose sides and median lines are commensurable. No. 42	58-59
Tube of uniform cross section is bent into the form of a cycloid, equal quantities of fluids of different specific gravity are poured in at the two cusps, find distance of upper levels of fluids from vertex. No. 62	243-244